

The Examiner recognizes that "Brown does not disclose . . . an active polymer barrier comprising a polymeric matrix with anhydrides" (Office Action page 3). For this, the Examiner turns to Wiercinski. The Examiner cites Wiercinski as describing a superabsorbent polymer that includes a hydrolyzed maleic anhydride polymer (col. 9, lines 1-5). Compositions are formed by mixing hydrophobic polymer particles dispersed in an aqueous phase and a superabsorbent polymer and allowing the mixture to cure (col. 5, lines 42-57). The superabsorbent polymer particles absorb the water from the aqueous phase. The Examiner argues that this teaches a polymeric matrix with anhydrides. Applicant respectfully disagrees.

Hydrolysis is the "decomposition or alteration of a chemical substance by water" 970 (McGraw-Hill Dictionary of Scientific and Technical Terms, Sybil P. Parker, ed., 5th ed., 1994). Anhydrides "undergo hydrolysis with ease" resulting in two equivalents of the corresponding carboxylic acid. (A. Streitwieser, Jr. and C.H. Heathcock "Introduction to Organic Chemistry" 491 (3d ed. 1985); see also "Acetic Anhydride" http://en.wikipedia.org/wiki/Acetic_anhydride).

When hydrolyzed anhydride polymers are used in Wiercinski, the anhydride groups have, by definition, already reacted with water. Thus, the "anhydride" chemical structure (-R-C(O)-O-C(O)-R-) no longer exists—it has been transformed into the corresponding carboxylic acid (-CH₃-COOH). Thus, the Examiner's argument that "it would have been obvious . . . to incorporate the polymer matrix with anhydride . . ." is not correct because at this stage the anhydride group no longer exists. Applicant reminds the Examiner that claim 17 is directed to "a material comprising a polymeric matrix with anhydrides," in contrast to the hydrolyzed materials of Wiercinski.

Wiercinski also notes that the superabsorbent polymer can include maleic anhydride/vinyl ether copolymer (col. 9, lines 24-31). However, as stated above, anhydrides hydrolyze with ease in the presence of water. Thus, during the formation of the composition, if there are any free anhydride functional groups in the copolymer particles, they hydrolyze in the presence of the aqueous solution and do not form a polymeric matrix with anhydrides, as required by claim 17. In fact, because Wiercinski describes exposing the superabsorbent polymer to an aqueous solution to result in a water-swollen superabsorbent polymer phase,

applicant submits that Wiercinski actually teaches away from forming an active polymeric barrier layer that binds moisture and oxidizing agents and includes a material comprising a polymeric matrix with anhydrides.

Further, the Examiner argues that the claimed and prior art products are identical or substantially identical in structure or composition and thus there is a *prima facie* case of obviousness (Office Action page 4). Because the polymer particles cited by the Examiner are hydrolyzed, if not as starting material then when they form a composition, they no longer include anhydrides and thus are not identical in structure or composition.

For at least these reasons, applicant submits that there is no *prima facie* case of obviousness pending with claim 17 or the claims that depend therefrom.

Claim 35

Claim 35 has been rejected under 36 U.S.C. §103(a) as being allegedly unpatentable over Brown and Wiercinski, above, in view of U.S. Pat. No. 6,841,497 ("Krell"). Applicant respectfully disagrees.

Claim 35 is directed to an organic electronic device having a substrate that includes an assembly of at least one active polymeric barrier layer and at least two adjacent first and second ceramic barrier layers, the first and second ceramic barrier layers having the same composition but exhibiting different microstructures from one another.

Krell describes a method of producing aluminum oxides (title). The aluminum oxides can have different crystal structures (col. 1, lines 9-15).

Krell fails to teach at least two adjacent first and second ceramic barrier layers, the first and second ceramic barrier layers having the same composition but exhibiting different microstructures from one another, as required by claim 35. "To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." (MPEP 2143.03). This limitation is not taught by Brown or Wiercinski (as acknowledged by the Examiner on page 6 of the Office Action), nor is it taught by Krell. Krell

only mentioned different structures, not having two adjacent ceramic barrier layers that have different microstructures from one another.

Assuming *arguendo* a suggestion in Krell of using adjacent layers with different microstructures from one another, the rejection is improper because Krell is not analogous art (MPEP 2141.01(a)). The examiner must determine what is "analogous prior art" for the purpose of analyzing the obviousness of the subject matter at issue. "Under the correct analysis, any need or problem known in the field of endeavor at the time of the invention and addressed by the patent [or application at issue] can provide a reason for combining the elements in the manner claimed." *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1397 (2007). Thus a reference in a field different from that of applicant's endeavor may be reasonably pertinent if it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his or her invention as a whole.

Krell is related to industrial ceramics and the fabrication of filtration membranes and catalyst carriers (col. 1, lines 8-14). Krell notes that the aluminum oxide materials are chosen because of their advantageous chemical and oxidative resistance (col. 1, lines 16-20). Krell is not (a) in the field of electronic devices and (b) does not address forming barrier layers. Specifically, Krell does not suggest decoupling defects in adjacent ceramic barrier layers that have different microstructures in order to improve barrier properties. Thus, the Examiner fails to make a *prima facie* case of rejection for claim 35.

Applicant respectfully requests that the rejection of claim 35 be withdrawn for at least these reasons.

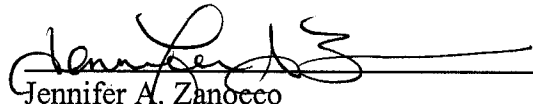
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Page : 5 of 5

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No fee is believed to be due. If, however, there are any charges or credits, please apply them to Deposit Account No. 06-1050.

Respectfully submitted,

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Jennifer A. Zanoeco
Reg. No. 54,563

Customer No. 26181
Fish & Richardson P.C.
Telephone: (650) 839-5070
Facsimile: (650) 839-5071

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THIRD EDITION

Introduction to Organic Chemistry

Andrew Streitwieser, Jr.

Clayton H. Heathcock

UNIVERSITY OF CALIFORNIA, BERKELEY

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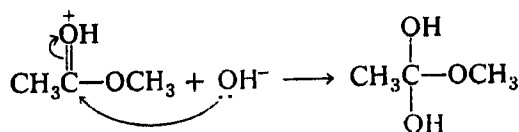
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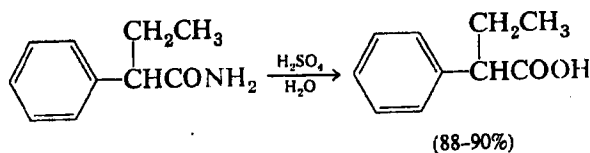
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Hydrolysis:
Nucleophilic
Addition-
Elimination



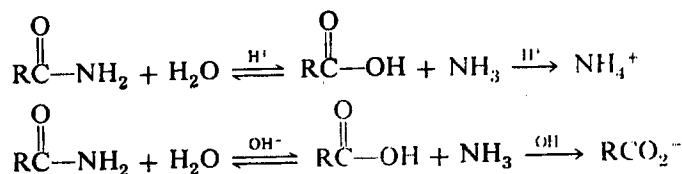
In aqueous solution this mechanism is not observed for a simple reason. In acidic solution, where the concentration of $\text{C}=\text{OH}^+$ species is appreciable, the concentration of OH^- is very small. In basic solution, where the concentration of OH^- is appreciable, the concentration of $\text{C}=\text{OH}^+$ is low.

Amides undergo hydrolysis to 1 mole of carboxylic acid and 1 mole of ammonia or amine. The reaction is catalyzed by acid or base. The hydrolysis of amides is more difficult than the hydrolysis of esters, and more vigorous conditions are normally required.

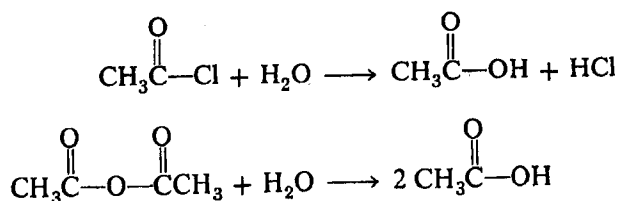


A mixture of 600 g of 2-phenylbutanamide, 1 L of water, and 400 mL of conc. sulfuric acid is refluxed for 2 hr. After cooling the mixture and diluting with 1 L of water, the oily organic layer is separated and distilled to yield 530-554 g of 2-phenylbutanoic acid, m.p. 42°C.

Both the acid- and base-catalyzed reactions are essentially irreversible. In the former case ammonium ion is produced; in the latter case a carboxylate ion is formed.



Acyl halides and anhydrides undergo hydrolysis with ease. Acetyl chloride reacts with water to give acetic acid and hydrogen chloride, whereas acetic anhydride gives two equivalents of acetic acid.



As with esters and amides, hydrolysis of acyl halides and anhydrides is subject to acid or base catalysis. However, both acyl halides and anhydrides react much more rapidly than esters, and uncatalyzed hydrolysis occurs readily, provided the reaction mixture is homogeneous. Since most acyl halides and anhydrides are only sparingly soluble in water, hydrolysis often appears to be slow. However, if a solvent is used that dissolves both water and the organic reactant, hydrolysis is rapid.



Acetic anhydride

From Wikipedia, the free encyclopedia

Acetic anhydride is the chemical compound with the formula $(\text{CH}_3\text{CO})_2\text{O}$. Commonly abbreviated Ac_2O , it is one of the simplest acid anhydrides and is a widely used reagent in organic synthesis. It is a colorless liquid that smells strongly of acetic acid, which is formed by its reaction with the moisture in the air.

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Production

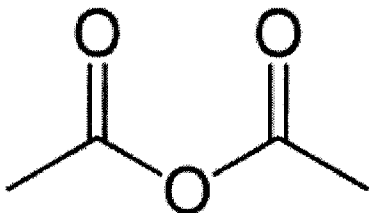
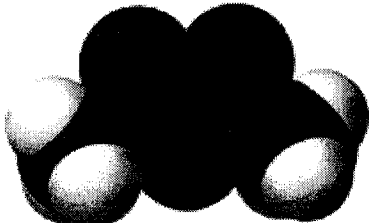
Acetic anhydride is produced by carbonylation of methyl acetate:^[1]



This process involves the conversion of methyl acetate to methyl iodide and an acetate salt. Carbonylation of the methyl iodide in turn affords acetyl iodide, which reacts with acetate salts or acetic acid to give the product. Rhodium and lithium iodides are employed as catalysts. Because acetic anhydride is not stable in water, the conversion is conducted under anhydrous conditions. In contrast, the Monsanto acetic acid synthesis, which also involves a rhodium catalyzed carbonylation of methyl iodide, is at least partially aqueous.

To a decreasing extent, acetic anhydride is also prepared by the reaction of ketene with acetic acid. Ketene is generated by dehydrating acetic acid at elevated temperatures. This production method was developed by Wacker Chemie in 1922, when the demand for acetic anhydride increased due to the production of acetic fibre.

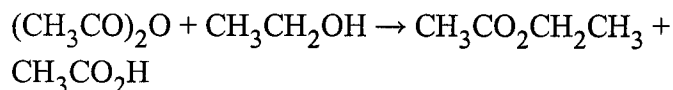
Due to its low cost, acetic anhydride is purchased, not prepared, for use in research laboratories.

Acetic anhydride	
	
	
IUPAC name	Ethanoyl ethanoate
Other names	Acetic anhydride Acetic acid anhydride Acetylacetate Acetyl oxide Acetic oxide Ethanoic anhydride
Identifiers	
CAS number	[108-24-7]
RTECS number	AK1925000
SMILES	CC(=O)OC(=O)C
InChI	1/C4H6O3/c1-3(5) 7-4(2)6/h1-2H3
Properties	
Molecular formula	C ₄ H ₆ O ₃
Molar mass	102.1 g/mol
Appearance	clear liquid
Density	1.08 g/cm ³ , liquid
Melting point	−73.1 °C
Boiling point	139.8 °C
Solubility in water	2.6% by weight; rapidly reacts to form acetic acid
Hazards	
EU classification	Corrosive (C)
R-phrases	R10, R20/22, R34

Uses

Ac₂O is mainly used for the acetylation of cellulose to cellulose acetate for photographic film and other applications.

In general alcohols and amines are acetylated.^[2] For example, the reaction of acetic anhydride with ethanol is:

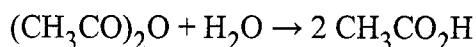


Often a base such as pyridine is added to function as catalyst. Lewis acidic scandium salts are also effective catalysts.^[3]

Aspirin, acetyl salicylic acid, is prepared by the acetylation of salicylic acid using acetic anhydride. Because of its use for the synthesis of heroin by the diacetylation of morphine, acetic anhydride (known as 'AA' in clandestine chemistry circles) is listed as a DEA List II Precursor,^[4] and restricted in many other countries.

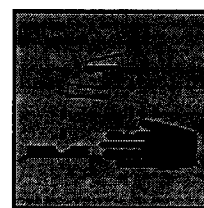
Hydrolysis

Acetic anhydride dissolves in water to approximately 2.6% by weight.^[5] Aqueous solutions have limited stability because, like most acid anhydrides, acetic anhydride hydrolyses to give acetic acid:^[6]



Safety

Acetic anhydride is an irritant and flammable. Because of its reactivity toward water, alcohol foam or carbon dioxide are preferred for fire suppression.^[7] The vapour of acetic anhydride is harmful.^[8]



Corrosive

Notes and references

- [^] Zoeller, J. R.; Agreda, V. H.; Cook, S. L.; Lafferty, N. L.; Polichnowski, S. W.; Pond, D. M. "Eastman Chemical Company Acetic Anhydride Process" *Catalysis Today* (1992), volume 13, pp.73-91. doi:10.1016/0920-5861(92)80188-S
- [^] Science is Fun.... *Chemical of the Week*. Retrieved on 2006-03-25.
- [^] Macor, J.; Sampognaro, A. J.; Verhoest, P. R.; Mack, R. A. "(R)-(+)-2-Hydroxy-1,2,2-Triphenylethyl Acetate" *Organic Syntheses, Collected Volume 10*, p.464 (2004). <http://www.orgsyn.org/orgsyn/pdfs/V77P0045.pdf>
- [^] ChemGuide. *Acid Anhydrides*. Retrieved on 2006-03-25.
- [^] British Petroleum. *Acetic Anhydride: Frequently Asked Questions (PDF)*. Retrieved on 2006-05-03.
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- [^] Data Sheets. *International Occupational Safety and Health Information Centre*. Retrieved on

2006-04-13.

8. ^ NIOSH. *Pocket Guide to Chemical Hazards*. Retrieved on 2006-04-13.

See also

- Acid anhydride

Retrieved from "http://en.wikipedia.org/wiki/Acetic_anhydride"

Categories: [Acid anhydrides](#) | [Lachrymatory agents](#) | [DEA List II chemicals](#)

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